MEMORANDUM **CH2MHILL**

Agenda: Brainstorming Session
Bunker Hill Mine Water Project

TO: Bunker Hill Mine Water Team

FROM: Jim Stefanoff/CH2M HILL

DATE: October 9, 1998

Date: October 20, 1998

Time: 9:30 - 4:30

Place: Ridpath Hotel, Cougar Room, 515 W. Sprague Ave, Spokane

Lunch and Refreshments: Will be provided

Purpose: To Brainstorm Components of the Presumptive Remedy

Agenda:

1. Welcome and Introductions
2. Description of the Problem
   - Acid Mine Drainage (AMD) Chemistry
   - Bunker Hill Mine AMD
   - Current AMD Management System
   - Schedule Drivers: Aging CTP, 5 to 6 years remaining sludge pace, new TMDL based treatment standards
3. Overview of the Presumptive Remedy Process
4. Group Brainstorming of Presumptive Remedy Components (Refer to Attached Table)
   - AMD Generation Mitigations
   - AMD Collection
   - AMD Conveyance to CTP
   - AMD Storage
   - Treatment
   - Sludge Management
5. Summarize and Wrap-Up

Bunker Hill Mine Water Management
Range of Options for Presumptive Remedy

AMD Generation Mitigations		AMD	AMD	AMD	Treatment		Sludge Management	
Options	Strategies	Collection	Conveyance to CTP	Storage	Primary	Enhanced	Dewatering	Disposal
Milo Forks Diversions	**West Fork Around Guy Caves and into new diversion**	**Collect and convey upper workings water into 9 Level ditch using existing workings, pump lower workings water from No. 2 Raise into 9 level Ditch, drain out Kellogg Tunnel**	**Normally Operate: Direct Pipe Feed to CTP, divert to lined pond only for shutdowns**	**In-Mine Storage from 13 Level to 11 Level, See Note 5**	**Lime HDS with Filtration, See Note 6**	**Sulfide Precipitation**	**Annual Sludge Drying in CIA Bed(s), Excavate and Haul**	**Haul to Milo Gulch Stopes**
	South Fork above Cate Fault into new diversion dam	Divert upper workings water to lower, pump from external location (e.g. Government Gulch)	Normally Operate: Direct pipe feed to lined pond then pump to CTP	In-Mine Storage from 12 Level to 11 Level		Enhanced Iron Co-Precipitation	Mechanical Dewatering and Haul	Haul to On-Site New Landfill
	Milo East (Main)			**Existing Lined Pond**		Ion Exchange		Haul to Off-Site New Landfill
Separate, collect, and discharge "clean" water	???			Additional Lined Pond		Evaporation and Crystallization		Haul to Off-Site Existing Landfill
In-Mine Water Diversions around acid producing zones	???					Membrane Filtration	None - Slurry Disposal	Pump to Lower Workings (No. 3 Shaft?)
Capping						Metal Recovery		Pump to Milo Stopes
Drill Hole Plugging	???							Add to Sandfill When Sandfill is Used Again
Plugging to Flood								
Air Seals								

Notes:

1. Major components of the presumptive remedy are separated by double lines. Options of each major component are separated by single lines.
2. A complete remedy will consist of one or more options of each component: AMD Generation Mitigation, AMD Collection, AMD Conveyance to CTP, AMD Storage, Treatment, and sludge managament.
3. Indicates current inclusion in presumptive remedy
4. Indicates currently screened out from further evaluation
5. This presumes that mine water has to be kept below 11 Level to prevent unaccepatable leakage to the river. It will be evaluated if the mine water can be kept below 10 Level.
6. While this is identified as the preumptive remedy, it will likely not meet the Pb, Cd, and Zn limits being considered as part of the CTP TMDL allocation. Enhanced treatment will likely be needed.